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Lakes Beneath Antarctic Ice Sheets Initiate, Sustain Flow Of Ice To The Ocean

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February 21, 2007

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DURHAM, N.H. -- One of the planet's most remote and little-understood features may play a crucial role in transporting ice from the remote interior of Antarctica towards the surrounding ocean and therefore impact sea level rise and regional and global climate change, according to a new research published in the February 22 issue of the journal *Nature*.

A team of scientists led by geophysicists Robin Bell and Michael Studinger from the Lamont-Doherty Earth Observatory at Columbia University, and including glaciologist Mark Fahnestock of the University of New Hampshire and colleagues from NASA and the University of Washington, discovered four large, subglaical lakes and, for the first time, linked these water bodies locked beneath miles of ice to fast flowing ice streams in Antarctica.

The scientists found that four separate lakes appear to contribute to the formation of an ice stream. Ice streams are large, fast-flowing features within ice sheets that transport land-based ice and meltwater to the ocean. One such stream, the Recovery Ice Stream, drains eight percent of the U.S.-sized East Antarctic Ice Sheet. The Recovery basin, unexplored since 1966, funnels an estimated 35 billion tons of ice into the Weddell Sea annually.

“It has been a puzzle to us why, in a few cases, ice streams reach well into the interior of the large ice sheets,” said Fahnestock of the UNH Institute for the Study of Earth, Oceans, and Space (EOS). Fahnestock added, “These lakes at the head of the Recovery system provide a compelling explanation.”

Until about a year ago, not many people cared much about subglacial lakes, according to Studinger of Columbia University. "That's changing, but we're still only just beginning to understand how these lakes, sealed beneath more than two miles of ice, have the potential to impact the rest of the world," he said.

The scientists examined satellite radar images and high-resolution laser profiles of the region for ice stream patterns and surface features indicating the presence of subglacial lakes beneath the ice. Not only did they find four new lakes, but they discovered that the lakes coincide with the origin of tributaries of the Recovery Glacier. Upstream of the lakes, the ice sheet moves at just 2 to 3 meters per year; downstream the flow increases to nearly 50 meters per year. The scientists conclude that the lakes provide a reservoir of water that lubricates the bed of the stream to facilitate ice flow and prevent the base of the sheet from freezing to the bedrock.

Moreover, their work suggests that subglacial lakes could play a role in and sea level rise as well as regional and global climate change. Meltwater at the base of ice streams increases the

flow of ice to the oceans, which could, in turn, contribute to higher sea levels worldwide. In addition, floods have been known to originate from the interior of the ice sheet in the past, possibly from subglacial lakes. These sudden pulses of fresh water could potentially interfere with nearby ocean currents that redistribute heat and carbon dioxide around the globe, disrupting the Earth's finely tuned climate system.

"It's almost as if the lakes are capturing the geothermal energy from the entire basin and releasing it to the ice stream." said Bell. "They power the engines that drive ice sheet collapse. The more we learn about them, the more we realize how important they are."

A photo is available to download here: http://unh.edu/news/img/BellStudingerFig1.jpg

Photo caption: Combined RADARSAT and ICESat images showing the Recovery Glacier Ice Stream (arrows) and location of four new subglacial lakes (A, B, C and D) that lie at the head of the stream. Credit: Chris Shuman and Vijay Suchdeo, NASA.